IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Appellant: **Wieslaw J. Roth, et al.**	§	Confirmation No.:	1528
Filed: May 4, 1999	§	Art Unit:	1764
Serial No.: 09/305,019	§	Examiner:	Tam M. Nguyen
For: ALKYLAROMATICS PRODUCTION	§	Docket No.:	10151

APPELLANTS' REPLY BRIEF UNDER 37 CFR 1.193(b)(1)

Mail Stop Appeal Brief-Patents
Commissioner of Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Appellants submit this Reply Brief to the honorable Board of Patent Appeals and Interferences in response to the Examiner's Answer, mailed June 2, 2004.

As required, the Reply Brief is being filed in triplicate.

ARGUMENTS

First, this Reply Brief does contain an explicit statement identifying the related appeals and interferences (See page 2 of Appellants' Brief).

The Examiner continues to rely on the combined teachings of Cheng et al. in view of Kuchenmeister et al. to reject instant claims 4-9. The problem to be solved in Kuchenmeister et al. is the excessive production of polyalkylbenzenes at high temperatures and pressures associated with *vapor phase* reactions, not liquid phase reactions as recited in the instant claims. In error, the Examiner points to the statement on page 3, lines 29-31 of Kuchenmeister et al. that "[t]he improvement in transalkylation control is attributed to the use of an aluminosilicate catalyst having a crystal size less than about 0.50 microns [sic, micron]" to provide motivation to combine the teachings of Kuchenmeister et al. with Cheng et al. This statement clearly refers back to the vapor phase problem to be solved, namely, the excessive production of polyalkylbenzenes in *vapor phase* alkylation reactions, as discussed on page 2 of Kuchenmeister et al. and does not apply to liquid phase reactions.

Independent claim 4 of the present invention recites both a liquid phase alkylation reaction and a transalkylation catalyst comprising TEA-mordenite having an average crystal size of less than 0.5 micron. It would not have been obvious at the time the invention was made to use the Kuchenmeister et al. catalyst in the alkylation process of Cheng et al. operated under *liquid phase* conditions, even if it would have been obvious to one having ordinary skill at the time the invention was made to use an aluminosilicate catalyst having a crystal size of less than 0.5 micron, as taught by Kuchenmeister et al., in the alkylation process of Cheng et al. operated under *vapor phase* conditions (which it was not). As earlier noted, different catalysts are generally used for vapor and liquid phase reactions because the reaction kinetics and catalytic activity are both affected by the pressure and temperature at which the reaction is occurring. Catalyst properties which improve the results of vapor phase reactions

cannot, therefore, be presumed to have a similar effect with respect to liquid phase reactions. Indeed, the more extreme temperature and pressure of vapor phase reactions result in diffusion limited operation where catalysis occurs primarily within catalyst pores while liquid phase reactions occur largely on the catalyst surface. Thus, it would not be obvious to one skilled in the art to combine Kuchenmeister et al.'s teachings respecting catalyst crystal size, made within the context of *vapor phase* operations, with that particular aspect of Cheng which relates to liquid phase operation, in order to arrive at the present invention.

Contrary to the Examiner's statement on page 8 of the Examiner's Answer, the first Declaration of Dr. Roth, filed October 24, 2002, shows unexpected results necessary to rebut the purported prima facie case of obviousness by presenting test data showing the claimed invention possesses unexpectedly improved properties. The first Roth Declaration shows the results of comparing a process for producing a monoalkylated aromatic compound using a transalkylation catalyst comprising TEA-mordenite catalyst having an average crystal size of less than 0.5 micron to a transalkylation catalyst comprising TEA mordenite having an average crystal size greater than 0.5 micron. As shown on the Table on page 4 of the first Roth Declaration, the TEA-mordenite catalyst having an average crystal size of less than 0.5 micron exhibited an 84% conversion of diisopropylbenzene after 3 hours on stream (an unexpected result) whereas the TEA-mordenite catalyst having an average crystal size of greater than 0.5 micron did not reach this level of conversion after 7 hours on stream.

The Examiner's case of prima facie obviousness was based on multiple references, Cheng et al. and Kuchenmeister et al., not Kuchenmeister et al. alone. Appellants clearly have compared, in the first Declaration of Dr. Roth, the transalkylation catalyst of the present invention, TEA-mordenite having a crystal size of less than 0.5 microns, to TEA-mordenite catalyst having a crystal size greater than 0.5 micron. In addition, the second Declaration of Dr. Roth, filed February 24, 2003,

has shown the criticality (for catalyst aging rate) in using TEA-mordenite of crystal size below 0.5 micron of the present invention versus conventional mordenite of crystal size below 0.5 micron.

The closest prior art need not be something relied on by the Examiner, i.e., a catalyst based on Cheng et al. in view of Kuchenmeister et al., which is obviously not available. *See In re Payne*, 606 F.2d at 316, 203 USPQ at 256 and *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769 (Fed. Cir. 1983). As noted in the second Declaration of Dr. Roth, Example 1 of Kuchenmeister et al. employs an unspecified catalyst having an average crystal size 0.41 micron. The diethylbenzene conversion rate in Example 1 after 1 day on stream is only 11% and that this rate decreases continuously with time on stream until, after 14.6 days, the diethylbenzene conversion rate is 2.8% (an aging rate of about 6%/day). In Comparative Example 1 of Kuchenmeister et al., which again employs an unspecified aluminosilicate catalyst but having an average crystal size of 0.70 μm, the diethylbenzene conversion rate after 1 day on stream is even lower, at 4.6%, but this increases or remains generally constant until 6.7 days on stream. The data in Kuchenmeister et al. suggest that the unspecified aluminosilicate catalyst used therein has extremely low activity for diethylbenzene conversion irrespective of crystal size and that, in the case of at least the small crystal material, the catalyst ages rapidly. For both of these reasons, it would be counterintuitive for one of ordinary skill in the art to consider the disclosure in Kuchenmeister et al. in seeking to improve the process of Cheng et al., particularly for a commercial application where long run times and hence low aging rates are critical.

The Examiner again argues on page 7 of the Answer that the three catalysts shown in Table 1 of the second Declaration of Dr. Roth had different silica:alumina ratios, alpha values, and surface areas and stated that it was unclear if the aging rate was dependent on one or a combination of these variables. It is respectfully noted that the Appellants are not claiming a reduction in aging based on a specific variable,

but have satisfied the requirement of showing that the claimed TEA-mordenite with a crystal size of less than 0.5 micron is surprisingly better than the less than 0.5 micron crystal size catalyst disclosed by Kuchenmeister et al. Catalysis is considered unpredictable and cannot be forecast by chemical composition, except by actual test. See, *Corona Cord Tire Co. v. Dovan Chemical Corp.*, 276 U.S. 358, 368-369 (1928). Catalytic effects are not ordinarily predictable with certainty. *In re Doumani et al.*, (CCPA 1960) 281 F.2d 215, 126 USPQ 408. Further, the effect of the modification of one prior art catalytic process in a manner employed in another prior art process which employs a different catalyst was held unpredictable. *Ex parte Berger et al.*, (POBA 1952) 108 USPQ 236.

The Examiner argues on page 9 that reliance on Innes et al. in combining Cheng et al., Kuchenmeister et al. and Innes et al. to reject claim 10 is for conditions effective to keep the Cheng et al. alkylation process under liquid conditions. The alkylation process of Innes et al. is for liquid phase alkylation or transalkylation using a very specific catalyst, zeolite beta. There is no teaching or suggestion that the same conditions would be effective for a transalkylation process using TEA-mordenite having a crystal size of less than 0.5 micron under liquid conditions.

On page 9 of the Answer the Examiner states that that one of skill would employ the teachings of Kuchenmeister et al. and Chu in the process of Cheng et al. Cheng et al. relies on Chu for the synthesis of TEA-mordenite having a Si/Al_2 molar ratio within the Si/Al_2 molar ratios recited in instant claims 11 and 12. As shown by Example 3 on pages 8 and 9 of the present application, the TEA mordenite produced according to the Chu patent has a crystal size greater than 0.5 micron. Clearly, TEA-mordenite prepared by Chu with the Si/Al_2 molar ratios recited in claims 11 and 12 would have an average crystal size of greater than 0.5 micron, and outside the average crystal size range of independent claim 1. The teachings of Chu and Kuchenmeister et al. are in fact conflicting.

CONCLUSION

Appellants respectfully submit that the foregoing arguments obviate all of the Examiner's final rejections in this case. The cited references, Cheng et al., Kuchenmeister et al, Innes et al. and Chu, neither disclose nor suggest the presently claimed invention. In view of this, reversal of these rejections by the Board is respectfully requested.

Respectfully submitted,

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